

**607.1**

606029-*	FREE DRAINING BASE TRENCH	LINEAR FOOT (METER)
606030-*	OUTLET PIPE, "size"	LINEAR FOOT (METER)

\* Sequence Number

## SECTION 607 GUARDRAIL

### 607.1-DESCRIPTION:

This work shall consist of the construction or reconstruction of guardrail in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Plans or established by the Engineer.

The types of guardrail are designated as follows:

Type 1, Galvanized Steel Deep Beam Type Guardrail

Type 2, Blank

Type 3, Blank

Type 4, Blank

Type 5, Galvanized Steel Double-Faced Guardrail (Deep Beam Type)

All installations of Type 1 & 5 Guardrail will be classified according to one of the designations specified. The guardrail class will be indicated in the pay items and on the Plans,

**Class I: 6 ft. - 3 in. (1 905 mm) post spacing with blocks**

**Class II: 12 ft. - 6 in. (3 810 mm) post spacing with blocks**

**Class III: 12 ft. - 6 in. (3 810 mm) post spacing without blocks.**

The construction of the guardrail shall include the complete furnishing, assembling and erecting of all component parts and materials at the location shown on the Plans or directed by the Engineer.

A Modified Cut Slope Terminal shall consist of supplying and installing additional length guardrail posts, an additional W-beam guardrail section (bottom beam), and standard guardrail cut slope terminal components

### 607.2-MATERIALS:

Materials shall meet the requirements of the following Subsections of Division 700:

MATERIAL	SUBSECTION
Galvanized Steel Deep Beam Type Guardrail Fasteners and Anchor Bolts	712.4
Steel Guardrail Posts	709.45
Pressure Treated Wood Guardrail Posts	710.3, 710.5
Zinc Rich Primer (Galvanized Repair)	711.21
Retroreflective Sheeting for Traffic Control	715.9.2.8
Concrete for Footers	715.12

All materials must be protected from damage during storage and handling. All materials, including materials which have been approved previously, will be subject to inspection by the Engineer as to condition at any time prior to or during incorporation of the material in the work. Materials which have been damaged shall not be used.

## CONSTRUCTION METHODS

### 607.3-SETTING POSTS AND PLACING FOOTERS:

**607.3.1-General:** Unless one type is specified, posts may be of steel, or wood, and the Contractor shall indicate at the preconstruction conference the type of post the Contractor elects to use and that type shall be used throughout the Project.

Post dimensions and details shall conform to the requirements shown on the Plans.

Guardrail posts shall be placed as shown on the Plans.

Posts shall be set plumb in holes dug by hand or mechanically. When posts are driven, the manner of driving shall be such as to avoid battering or distorting of posts. Post holes shall be backfilled with acceptance material placed in maximum six inch (150 mm) loose layers and thoroughly compacted.

All posts damaged during erection or driving shall be removed and replaced without additional cost. Any damage to post galvanizing shall be repaired by a material meeting the requirements of 711.21.

Painting, when called for, shall not be done in damp or freezing weather and shall only be done when the posts are thoroughly dry.

**607.3.2-Steel Posts:** Galvanized steel posts shall not be painted except for touch up painting with zinc primer as specified.

**607.3.3-Pressure Treated Wood Posts:** All wood posts shall meet the

#### 607.3.4

requirements of Section 710.

#### 607.3.4-Blank

**607.3.5-Offset Blocks:** Offset blocks shall be used when called for by the Plans.

**607.3.6-Footers for Breakaway Cable Terminal And Special Trailing End Terminal:** Footers for breakaway cable terminal and special trailing end terminal shall be constructed of cast-in-place concrete meeting the requirements of 715.12. Concrete shall be placed promptly and without segregation after mixing.

Concrete footers shall be carried down to at least the depth, and shall be not less than the dimensions shown on the Plans. The top of all footers shall be not less than the dimensions shown on the Plans. The top of all footers shall be flush with the ground line and shall be troweled to a smooth finish with a slope to drain away from the post.

After excavating for the footer, the earth coming in contact with the concrete must be moistened to a depth of at least 2 inches (50 mm) just prior to placing the concrete in the hole. No curing will be required other than the placing of not less than 4 inches (100 mm) of loose moistened earth, free from clods or gravel, over the top of the footer immediately after placing the concrete. All excess excavation from footers and loose material used for curing shall be disposed of in a manner satisfactory to the Engineer.

#### 607.4-ERECTING RAIL ELEMENTS:

**607.4.1-General:** Rail elements shall be erected in a manner resulting in a smooth, continuous installation.

All bolts, except where otherwise required, such as expansion joint bolts and adjustment bolts, shall be drawn tight. Bolts through expansion joints shall be drawn up as tight as possible without being tight enough to prevent the rail elements from slipping past one another longitudinally. Bolts shall be sufficiently long to extend at least ¼ in. (6 mm) beyond the nuts. Except where required for adjustment, bolts shall not extend more than ½ in. (13 mm) beyond the nuts. Bolts through variable thickness posts shall be cut off a maximum of ½ in. (13 mm) beyond the nuts.

All metal shall be fabricated in the shop. Burning, drilling or welding may be done in the field when shown on the Plans. Field punching, cutting, and drilling may be permitted after it has been demonstrated that it will not result in damage to the surrounding metal and if approved by the Engineer.

Galvanized surfaces which have been abraded so that the base metal is exposed, any field welded surfaces, threaded portions of all fittings and fasteners, and cut ends of bolts shall be protected with zinc rich primer or by field galvanizing, when approved by the Engineer.

**607.4.2-Type 1 Guardrail (Galvanized Steel Deep Beam):** The rail shall be erected so that the bolts at expansion joints will be located near the centers of the slotted holes. The rail elements shall be spliced by lapping in the direction of traffic. The rail elements at each splice shall make contact throughout the area of the splice. Shop-curved rail shall be used on curves with radii less than 150 ft. (45 m).

Any surface damage to galvanized beams shall be repaired with a material meeting the requirements of 711.21.

When called for, guardrail end terminals conforming to the details shown on the Plans shall be constructed.

#### **607.4.3 to 607.4.4-Blank**

**607.4.5-Type 5 Guardrail (Galvanized Steel, Double-Faced):** This rail shall be erected in accordance with the requirements of 607.4.2 and as shown on the Plans.

#### **607.5-GUARDRAIL REMOVED AND REBUILT OR STORED:**

This item shall consist of carefully dismantling, removing, and reerecting or storing, at the location specified on the Plans, of existing guardrail. Rebuilt units shall be of the same type, spacing of members, etc., as original guardrail.

New material specified on the Plans shall conform to the requirements for the construction of new guardrail of the type being reset.

All salvagable materials shall be removed and reerected (or stored if so specified) with reasonable care. Posts, rails, fabric, and cables for reerected rails shall be obtained from salvage sources, but the Contractor shall furnish whatever additional bolts, clips, or incidental hardware as may be necessary to complete the guardrail.

Methods of re-erection shall conform to the requirements for the construction of new guardrail of the type being reset, except as modified on the Plans.

Where removal and storage is specified, the bolts, cables, and other hardware shall be carefully removed from all rails, posts, and other members, and all parts shall be sorted and stored at the locations specified. Rails shall be properly stacked, cable shall be free from kinks and rewound on the cable spools, and all such reasonable care shall be exercised in the handling, storing, and preserving of materials as will insure the maximum salvage value for the entire operation.

#### **607.6-METHOD OF MEASUREMENT:**

The quantity of work done will be measured in linear feet (meters) of guardrail of the type indicated on the Plans, complete in place and accepted, measured along the face of the rail from center to center of end posts. the linear feet (meters) of double-faced guardrail will be measured along the face of one rail only.

## 607.7

When end terminals or attenuators for steel beam type guardrail are used, they will be measured separately and will be the actual number of end terminals or attenuators constructed, complete in place and accepted.

Where 25 ft. (1620 mm) sections of steel deep beam guardrail having 3 ft. - 1½ inches (952.5 mm) or 6 ft. - 3 inches (1905 mm) post spacings are utilized at bridges, they will be measured and paid for as 6 ft. - 3 inches (1905 mm) post spacing with blocks (Class I) and in accordance with their appropriate guardrail type.

Where 18 ft. - 9 in. (5 715 mm) sections of guardrail - bridge transitions, having 3 ft.- 1½ in. (952.5 mm) and 1 ft. - 6¾ in. (476.25 mm) postspacings, are utilized at bridges or in conjunction with other structures, these sections shall be measured and paid for as W-Beam Guardrail Bridge Transition. The cost of the double, top w-beam (12 ft. - 6 in. section (3 810 mm)), bottom w-beam (rubrail), guardrail end special hardware, connectors and incidentals utilized in guardrail - bridge transit shall be included in W-Beam Guardrail Bridge Transition.

Where w-thrie beam guardrail - bridge transitions consisting of two nested thrie beam panels and a transition section from w-beam to the thrie hewn guardrail having a total length of 18 ft. - 9 in. (5 715 mm) are utilized at bridges or in conjunction with other structures, these sections shall be measured, and paid for as Thrie Beam Guardrail Bridge Transition. The cost of the double thrie beam 12 ft. - 6 in. sections (3 810 mm), the 6 ft. - 3 in. (1 905 mm) section of w-thrie beam transition, the 6 ft. - 6 in. (1 901.2 mm) length steel posts, guardrail terminal connectors, and all special hardware, connectors, and incidentals utilized in this guardrail - bridge transition shall be included in Thrie Beam Guardrail Bridge Transition.

Where guardrail end terminals per the approved list on file with the Materials Section of the Contract Administration Division are utilized on projects, these terminals shall be measured and paid for as Flared End Terminal or Tangent End Terminal as shown in the plans. The cost of all hardware shown on the pre-approved shop drawings for the end terminals and the reflective sheeting on the nose of the terminal shall be included in the cost of the Flared End Terminal, per each or Tangent End Terminal, per each.

### 607.7-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall constitute full compensation for furnishing, preparing, placing, and erecting all materials, and all labor, tools, equipment, supplies such as nuts, bolts, washers, cables and any other incidentals necessary to complete the work.

Payment for modified cut slope terminals will include extra length guardrail posts as required, excavating and backfilling the trench, and reshaping, seeding and mulching of the cut slope for Cut Slope Terminal Type A Modified; shall include extra length guardrail posts as required, drilling holes into the cut slope, and furnishing and installing rock bolts (2), end shoes (2), and hardware for Cut Slope Terminal Type B Modified: and shall be paid for Cut Slope Terminal

Type A or B Modified ", per each.

### 607.8-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
607001-*	TYPE 1 GUARDRAIL, CLASS	LINEAR FOOT (METER)
607005-*	TYPE 5 GUARDRAIL	LINEAR FOOT (METER)
607006-*	THRIE BEAM GUARDRAIL BRIDGE TRANSITION	EACH
607007-*	W-BEAM GUARDRAIL BRIDGE TRANSITION	EACH
607009-*	"TYPE" GUARDRAIL, REMOVED AND RESET	LINEAR FOOT (METER)
607010-*	"TYPE" GUARDRAIL, REMOVED AND STORED	LINEAR FOOT (METER)
607025-*	CUT SLOPE TERMINAL, TYPE "type"	EACH
607027-*	BULLNOSE ATTENUATOR	EACH
607030-*	SPECIAL TRAILING END TERMINAL	EACH
607035-*	GUARDRAIL ELEMENT	EACH
607036-*	GUARDRAIL END SHOE	EACH
607037-*	BUFFER END SECTION	EACH
607039-*	6X6X14 IN (150X150X350 MM) TREATED WOOD BLOCK	EACH
607040-*	8X6X14 IN (200X150X350 MM) TREATED WOOD BLOCK	EACH
607041-*	13 FT – 6.5 IN (4120 MM) CURVED RAIL ELEMENT	EACH
607042-*	6 FT (1800 MM) STEEL POST	EACH
607043-*	8 FT (2400 MM) STEEL POST	EACH
607044-*	8X6X72 IN (200X150X1800 MM) TREATED WOOD POST	EACH
607045-*	5.5X7.5X44 IN (140X190X1100 MM) TREATED WOOD POST	EACH
607046-*	7 IN ROUND X 6 FT (175 ROUND X 1800 MM) TREATED WOOD POST	EACH
607047-*	10X10 IN X 6 FT (250X250X1800 MM) TREATED WOOD POST	EACH
607048-*	STRUCTURE MOUNTED POST, ANCHORED	EACH
607049-*	10 FT (300 MM) STEEL POST	EACH
607050-*	8X6 IN X 5 FT (200X150X1500 MM) STEEL TUBE SLEEVE	EACH
607051-*	REMOVE AND RESET GUARDRAIL POST	EACH
607065-*	FLARED END TERMINAL	EACH
607066-*	TANGENT END TERMINAL	EACH

\* Sequence Number